Open Access
J. Glob. Innov. Agric. Sci., 2023, 11(4):629-636
ISSN (Online): 2788-4546; ISSN (Print):2788-4538
DOI: https://doi.org/10.22194/JGIAS/23.1146
http://www.jgiass.com

The antioxidant property of home-cooked orange-fleshed and purple-fleshed sweet potato

Lynn Michelle L. Gorospe

Tarlac Agricultural University, Philippine
*Corresponding author's e-mail: gorospelynnmichelle1865@gmail.com

One property inherent to sweet potato because of the presence of phytochemicas is its antioxidant property. As proven by researches, antioxidant property is affected by cooking. This study determined the effect of four home cooking methods: steaming, boiling, baking, and frying on the antioxidant property of orange-fleshed and purple-fleshed sweet potatoes. The antioxidant property of raw and cooked we measured samples for their Total Phenolic Content (TPC) using Folin-Ciocalteu assay and their antioxidant activity based on the EC50 value of the DPPH assay. The TPC of orange-fleshed sweet potato was significantly increased by boiling and steaming. Baking and frying decreased the TPC of the orange-fleshed. The TPC of the purple-fleshed variety was not affected by the cooking methods but compared to the orange-fleshed, the TPC of the purple variety is significantly higher in both the raw and cooked forms. Based on the result of the DPPH assay, cooking significantly affected the antioxidant activity of both varieties ($p<0.05$). Steaming gave the highest increase for both varieties. Boiling caused the lowest increase for the orange-fleshed but didn't give a significant effect on the antioxidant activity of the purple-fleshed. Comparing the two varieties, the raw and cooked purple-fleshed sweet potato have better antioxidant activity based on DPPH assay except for the steamed samples wherein the antioxidant activity of steamed orange-fleshed sweet potato is significantly higher ($p<0.05$) than that of the purple variety. It can be concluded that steaming is the best cooking method for the two sweet potato varieties.
Keywords: Anti-oxidant, cooking, sweet potato, total phenolic content.

INTRODUCTION

People in this generation adjust to the changes brought about by modernity by altering their lifestyles, which includes altering their eating habits. Nowadays, a greater number of people consume meals heavy in fats, sugars that are free of calories, salt, or potassium, and many do not eat enough fruits, vegetables, or dietary fibre (WHO., 2018). Unwanted consequences of this nutritional imbalance in humans include the rise in cancer and cardiovascular disease cases. It can correct this imbalance by increasing the consumption of plant foods and reducing the intake of foods from land animals in the diet in order to maintain excellent health (Bye *et al.*, 2021).

The consumption of plant-based diets has been linked to a lower risk of developing chronic illnesses and cardiovascular disease. This is likely because plants contain phytochemicals. Phytochemicals, sometimes known as "plant chemicals," are substances that have no nutritional value but are biologically active and have been shown to shield people against illness. These include substances found naturally in plants, such as flavonoids, beta-carotene, chlorophyll, and anthocyanins. Consuming phytochemicals such as ascorbic acid, carotenoids, polyphenols, tocopherols, and tocotrienols has been linked to the prevention of numerous illnesses, such as cancer, heart disease, diabetes, hypertension, stroke, metabolic syndrome, and other degenerative diseases (Gupta and Gupta., 2013).

Antioxidant phytochemicals are responsible for the health advantages of phytochemicals as well as their capacity to prevent or treat degenerative diseases and other chronic illnesses (Zhang *et al.*, 2015). Antioxidants are chemicals that can postpone or stop certain kinds of cell damage. They can be created by humans or discovered naturally. Fruits and vegetables are often rich sources of natural antioxidants. Because of this, a number of dietary supplements are claiming to have positive impacts on customers' health and wellness by combining plant ingredients that naturally possess antioxidant properties. Consumer acceptance of food products that are considered as healthful is higher (Ares and Gambaro., 2007).

Gorospe, L.M.L. 2023. The antioxidant property of home-cooked orange-fleshed and purple-fleshed sweet potato. Journal of Global Innovations in Agricultural Sciences 11:629-636.
[Received 17Mar 2023; Accepted 22 Aug 2023; Published 22 Dec 2023]

Antioxidants reduce cell damages caused by free radicals (Jamshidi-Kia *et al.*, 2022) and are used as a defence against free radical damage, and are critical for maintaining optimum health and well-being (Jat and Nahar., 2017).

Free radicals are implicated to a lot of diseases like diabetes mellitus, arthritis, cancer, and ageing; Singh *et al.* (2015) have associated ischemic heart disease, atherosclerosis, cardiac arrhythmia, hypertension, and diabetes with free radical formation. They are produced in the body as a by-product of cellular oxidation reactions and other factors such as alcohol, tobacco, prescription drugs, harmful chemicals, and pollutants (Buyukokuroglu *et al.*, 2001). Free radicals can adversely alter lipids, proteins and DNA. Lipids are highly prone to free radical damage resulting in lipid peroxidation that can lead to adverse alterations. Free radical damage to protein can result in loss of enzyme activity (Devasagayam *et al.*, 2004).

Research on the detrimental effects of free radicals on health has drawn more attention to the protective function that antioxidants play against these harmful effects. Antioxidants neutralise the free radicals that our bodies produce by interacting with them in a safe way and stopping the chain reaction before it damages any important components (Sarma *et al.*, 2010). According to research by Devasagayam *et al.* (2004), antioxidants may be able to regulate or perhaps prevent some diseases brought on by free radicals. Regular dietary antioxidant consumption is crucial for protecting against human diseases linked to free radical damage to cellular DNA, lipids, and proteins (Jacob and Burri., 1996).

One plant food that naturally contains antioxidant is sweet potato. It is one of the major root crops grown in the Philippines. Sweet potato [*Ipomoea batatas* (L.) Lam.], locally known as *camote* is commonly cultivated in the country and is known to be a cheap food in the Philippines. In a study made by Teow *et al.* (2007), sweet potato was consistently found to contain antioxidants using different methods of analysis. The different parts of sweet potato – flowers, stems, leaves and roots exhibit antioxidant properties (Jung *et al.*, 2011). The high antioxidant activity of sweet potato indicates a good characteristic of sweet potato on their potential health benefits. (Ji *et.al.*, 2015).

Consuming sweet potatoes on a regular basis may help lower the risk of obesity, type 2 diabetes, and cardiovascular illnesses. In a study made by Trinidad *et al.*, (2013), When consumed on a regular basis, sweet potatoes and cassava can help people with moderately elevated serum glucose and cholesterol levels by raising HDL-C and lowering LDL-C.

Its potential health benefits will eventually contribute to the sweet potato's increased market value. According to Mark-Herbert (2002), a dietary product can become more financially viable if it is shown to avert the start of the growing number of lifestyle disorders (such as cancer, coronary heart disease, and other indications of poor health management).

Like any other vegetable, sweet potatoes are typically prepared at home using heat techniques like steaming, boiling, baking, and frying.

Food products' antioxidant properties are often impacted by processing. A 1-min thermal treatment significantly decreased ($p < 0.05$) the total phenolic content of all the vegetables studied, and, with the exception of shallots and cabbage, the antioxidant activities of kale, spinach, and swamp cabbage also significantly decreased ($p < 0.05$) following thermal treatment. The study was conducted to determine the total antioxidant activity and phenolic content of selected common vegetables (kale, spinach, cabbage, swamp cabbage, and shallots) (Ismail *et al.*, 2004).

The effects of processing, specifically cooking, on phytochemical content on plant-food is inconclusive (Hwang *et al.*, 2012). Cooking processes gave different effects on the antioxidant activity of plant foods. Turkmen *et al.*, (2005) discovered that different cooking techniques increased the antioxidant activity of pepper, green beans, broccoli, spinach, and squash while having no effect on the antioxidant activity of leek, peas, or squash.

Inconclusive results were also obtained from studies on the impact of preparing sweet potato tubers on their antioxidant properties. Analysis from one study reveals that the phenolic content of sweet potatoes made using six different home processing/cooking methods varies greatly. while deep-frying or boiling, the phenolic concentration decreases by approximately 40% from 7% while baking. The following order of the cooking techniques resulted in notable decreases in total phenolics: boiling, deep-frying, sautéing, steaming, microwaving, or baking in an oven (Jung *et al.*,2011).

According to a different American study, steam heating increased the concentration of all the specific phenolic acids found in the sample as well as total phenolics in a statistically non-significant way. (Truong *et al.*,2007) On the other hand, home processing techniques increased the phenolic content and anti oxidant activity of all four Egyptian sweet potato cultivars studied. The deep-frying process exhibited the highest increase in phenolic content and antioxidant capacity (Bellail *et al.*, 2012). Similar results were reported by Tokusoglu and Yildirim (2012), that steaming, boiling, and frying increased the antioxidant activity of sweet potato with steaming process giving the highest percentage of increase (1.24 fold).

The purpose of this study was to examine the antioxidant properties of cooked and raw purple- and range-fleshed sweet potatoes that are produced in one of the nation's leading sweet potato producing regions. Positive study findings will encourage consumers to purchase sweet potato-based culinary items, boosting the root crop's marketability and consumption. In the long run, a rise in the value of the root crop will benefit sweet potato growers in terms of generating revenue.

The findings might potentially offer details that assist customers in selecting the best cooking method for sweet potatoes depending on their antioxidant content. Food processors that want to create novel sweet potato-based functional foods and value-added products may find the study's findings helpful as well.

***Objectives of the study*:** The quantity of phenolic compounds and antioxidant activity in sweet potatoes were discovered to be influenced by a variety of circumstances. Planting technique and conditions, tissue growth stage, tissue type (various plant parts), genotype, postharvest care (curing, storage temperature, length), and processing technique are some of these factors.

This study examined how different cooking techniques affected the antioxidant and phenolic component contents of sweet potatoes with purple flesh and orange flesh that were grown in Paniqui, Tarlac. It sought to;

1. Examine the purple- and orange-fleshed sweet potatoes' total phenolic acid content (TPC) and antioxidant properties using the DPPH assay.
2. Compare these attributes between the two sweet potato kinds.
3. Examine the effects of steaming, boiling, baking, and frying on the antioxidant properties and overall phenolic acid level of sweet potatoes with purple and orange flesh.

MATERIALS AND METHODS

***Materials and Chemicals*:** Methanol, ethanol, 2,2-diphenyl-1-picrylhydrazyl (DPPH), gallic acid, and Folin-Ciocalteau reagents were supplied by Chemline, Philippines. All the chemicals and reagents used were of analytical grade.

***Sample Collection*:** The two types of Ipomoea batatas, or sweet potato, tubers were gathered in Paniqui, Tarlac. These were the orange-fleshed sweet potato, known to the natives as cinarrot, and the purple-fleshed sweet potato, known as inube.

***Sample preparation and cooking processes of sweet potatoes*:** For every sweet potato variety, ten samples measuring 120–170 g were collected and ready for analysis. Twenty-five minutes of steaming, fifteen minutes of boiling, fifteen minutes of baking at 200 degrees Celsius, and four minutes of frying at 150 degrees Celsius in 250 millilitres of cooking oil were applied to the remaining sample, leaving aside five percent of the total. After washing, the sweet potatoes with orange and purple flesh were cut into slices that were ¼ centimetre thick.

For three to four days, the raw samples were allowed to air dry. The cooked samples were also allowed to air dry. The materials were dried, then ground into a powder and kept in the refrigerator in colored vials until the analyses were completed.

***Preparation of the sweet potato extracts*:** Ten millilitres of methanol were used to extract one gramme of samples from each treatment, which were stored in dark-colored vials at room temperature for 48 hours. Whatman filter number one was used to filter the mixes. The filtrates were gathered and used as the extracts in test tubes. The phenolic content and DPPH (free-radical scavenging activity) assays were performed on each methanolic extract.

***Determination of the total phenolic content (folin-ciocalteau method) of sweet potatoes*:** The procedure for determining the phenolic content of sweet potatoes was adapted from Ghasemzadeh *et al.* (2010). Gallic acid was used as standard. A calibration curve of gallic acid was prepared to quantify the total phenolic content of the samples using the concentrations: 0, 0.5, 5, 50, 500 mg L^{-1}.

One milliliter of the extracts and these standards were added, along with ten milliliters of deionized water and one milliliter of Folin-Ciocalteau reagent. Two milliliters of 20% sodium carbonate (Na2CO3) were added to each combination five minutes later. For one hour, the combinations were left to react in the dark. The solutions' absorbance was then calculated at 750 nm using a Hitachi U2900 spectrophotometer. Following calculation, the samples' total phenolic content was reported as gallic acid equivalent (GAE) mg g^{-1} of dry plant matter.

***Determination of Antioxidant Activity using DPPH Radical Scavenging Assay of Sweet Potatoes*:** The procedure outlined by Chan *et al.*, (2007) was utilized to ascertain the sweet potato extracts' ability to scavenge free radicals by employing the stable 1,1-diphenyl-1-picrylhydrazyl (DPPH). Sweet potato extracts were produced in various dilutions with concentrations of 0.010, 0.020, 0.030, 0.040, and 0.050 mg mL^{-1}. In order to prepare the DPPH solution, 6.0 milligrams was dissolved in 100 milliliters of methanol. Next, a test tube holding two milliliters of DPPH solution was filled with one milliliter of extract from each dilution.

Control was prepared by adding 1 mL of methanol to 2 mL of DPPH solution. Ascorbic acid was used as standard.

After giving the combinations a good shake, they were let to stand in the dark for thirty minutes. At 517 nm, the absorbance of the resultant solutions was measured using a Hitachi U2900 spectrophotometer. The stable free DPPH radical could be measured at this wavelength without any interference. The following formula was used to determine each extract's scavenging activity on the DPPH radical:

$$\%RSA = \left(1 - \frac{Absorbance\ of\ sample}{Absorbance\ of\ control}\right) \times 100$$

A lower absorbance indicates a higher scavenging effect. The EC_{50} value (mg mL^{-1}) is the effective concentration at which DPPH radicals were scavenged by 50%. The EC_{50} was determined using Microsoft Excel 2007. EC_{50} of the DPPH was obtained by linear regression analysis using Microsoft Excel by plotting the results of the %RSA against the concentration of the sample. The results were expressed as ascorbic acid equivalent.

***Statistical analysis*:** Three duplicates of each analysis were performed, and the results were reported as mean ± standard deviation (SD). To determine whether there was a statistically significant difference between the cooked and uncooked sweet potato tubers, analysis of variance (ANOVA) was employed. A 95% confidence level ($p < 0.05$) was used to determine statistical significance for differences. Using the t-test ($p < 0.05$), group differences (between the two sweet potato kinds) were assessed.

RESULTS AND DISCUSSION

The phenolic content of two types of sweet potatoes (Ipomoea batatas) that were cooked differently is shown in Figure 1. The orange variety's phenolic content was greatly impacted by cooking, but not the purple ones. In comparison to unprocessed sweet potatoes (245.125±5.13 mg kg^{-1}) of the same variety, boiling yielded the maximum phenolic content in the orange-fleshed variety (281.625±2.30 mg kg^{-1}) in all cooking procedures. In addition to boiling, steaming raised the orange flesh's phenolic content to 262±2.47 mg kg^{-1}.

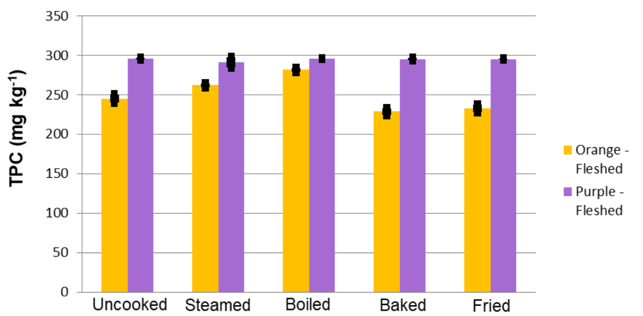

Figure 1. Phenolic content of orange- and purple-fleshed sweet potatoes (mg/kg)

When orange-fleshed sweet potatoes were boiled or steamed, their phenolic content rose noticeably by 14.89% and 6.88%, respectively, above their raw state. The phenolic content of sweet potatoes with orange flesh increased twice as much when they were boiled as when they were steamed. The orange-fleshed potato's tissues may have ruptured during steaming or boiling, revealing more of the phenolic components present and increasing the phenolic content as equivalents of gallic acid (Tokusoglu and Yildirim, 2012).
On the other hand, baking and frying decreased the phenolic content of the orange-fleshed variety to 228.625±3.54 and 232.75±4.42 mg kg^{-1}, respectively, when compared to the unprocessed, 245. 125±5.13 mg kg^{-1}. There was a decrease of 6.73% in the baked orange-fleshed and 5% when fried. However, the difference was not significant ($p<0.05$). This indicates that baking and frying had a comparable impact on the amount of phenolics in orange-fleshed sweet potatoes. The order in which boiling, steaming, baking, and frying impact the phenolic content of orange-fleshed sweet potatoes is significant.
In every cooking method, the purple-fleshed cultivar has a higher phenolic content than the orange-fleshed species. However, the amount of phenolic content in purple-fleshed sweet potatoes was unaffected by cooking methods. ($p<0.05$). This demonstrates the heat-stable nature of the phenolic components found in purple-fleshed sweet potatoes. Compared to orange- and white-fleshed cultivars, a breeding line with purple flesh had a greater total phenolic content and antioxidant activity (Padda, 2006).
Sweet potatoes' phenolic content is impacted by cooking methods. The impact of cooking sweet potatoes and other fruits and vegetables to their phenolic content has been the subject of conflicting reports. The following order of increases was seen in the phenolic content of heat-treated samples of Egyptian-grown sweet potato (Ipomoea batatas) cultivars: Baking, boiling, deep-frying, and microwaving (Bellail *et al.*,2012). Furthermore, four sweet potato cultivars underwent thermal processing (boiling for 20 minutes), which increased the total phenolic content. The increases ranged from 21.1% to 79.1% (Rautenbach *et al.*, 2010). Sweet potato leaves' polyphenol content increased by 9.49% when they were steamed, however it decreased when they were boiled, microwaved, and fried (15.73%). (Sun *et al.*, 2014). Other studies reported, steam cooking had no effect on the total phenolics and all the individual phenolic acids identified in sweet potato cultivars grown in the United States (Truong *et al.*, 2007).
Other fruits and vegetables' phenolic content was likewise impacted by cooking. The amount of phenol in potato tubers that underwent various processing methods rose. The following cooking methods enhanced the amount of phenolics in potatoes: baking, frying, pressure cooking, microwaving, sautéing, and boiling (Bemben and Sadana., 2013). However, Perla *et al.*, (2012) found boiling, microwaving and baking caused a decrease in the phenolic content of potato tubers.
***Antioxidant activity of orange- and purple-fleshed sweet potatoes*:** The antioxidant activity of sweet potatoes after several cooking methods is displayed in Figure 2. Cooked sweet potatoes were shown to have an antioxidant activity of EC50 (mg kg -1). High antioxidant or radical scavenging activity is indicated by a low EC50 value. An elevated EC50 value indicates less antioxidant activity (Jothy *et al.*, 2011).
The antioxidant activity of both types of sweet potatoes was considerably impacted by cooking ($p<0.05$). Sweet potatoes' antioxidant content increased after they were heated. When compared to unprocessed sweet potatoes, steaming produced the maximum antioxidant activity in both kinds, at 285.38±0.47 mg kg^{-1} for orange-fleshed sweet potatoes and 296.24±0.57 mg kg-1 for purple-fleshed sweet potatoes. The orange- and purple-fleshed varieties' antioxidant activity was raised by 70% and 59%, respectively, throughout the cooking procedure. The boiling sweet potatoes had the lowest

antioxidant activity, with orange- and purple-fleshed values of 772.065±1.70 and 705.785±3.61, respectively. It can be observed that the following order of cooking—steam, fried, baked, boiled, and raw—increased the antioxidant properties for both kinds.

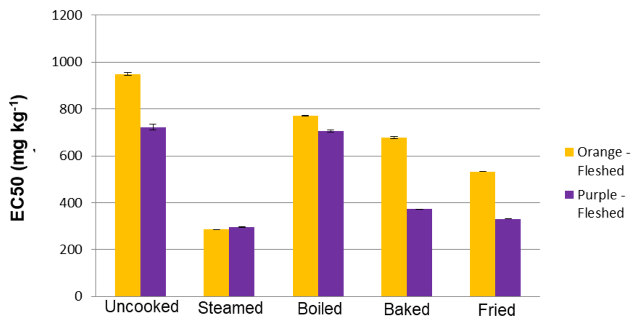

Figure 2. Antioxidant activity of orange- and purple-fleshed sweet potatoes.

Cooking significantly increased the antioxidant activity in orange-fleshed potato by 70% (steaming), 43.8% (frying), 28.6% (baking), and 18.6% (boiling). On the other hand, the effect of cooking on the antioxidant property of purple-fleshed caused also a significant increase by 59% (steaming), 54.2% (frying, 48.5% (baking), and 2.3 % (boiling). Boiling purple-fleshed sweet potato does not affect its antioxidant property compared to the unprocessed.

Between the two varieties, the purple-fleshed had better antioxidant activity based on DPPH assay than the orange-fleshed both in the processed and the unprocessed forms except for the steamed samples wherein the antioxidant activity of steamed orange-fleshed sweet potato is significantly higher ($p<0.05$) than that of the purple variety.

Based on the results, to get the maximum antioxidant activity from eating cooked sweet potato, the best cooking process is steaming whether it be orange- or purple-fleshed. Next to steaming, frying and baking can also improve the antioxidant activity of sweet potatoes. Boiling orange-fleshed sweet potato has better antioxidant property than similarly cooked purple-fleshed.

The results of this study conform with the study of Tokusoglu and Yildirim (2012) that boiling and steaming of Turkish sweet potatoes significantly increased the antioxidant activity by 86.96% and 97.92% radical inhibition effect compared to the raw which had only 78.75%. Frying lowered its radical inhibition to 57.89% to 57.89%. They further explained that steaming and boiling cause rupture of the tissues of sweet potato exposing more of the antioxidant constituents which could have led to increased antioxidant activity.

On the other hand, Truong and Avula (2010) revealed that boiling, roasting, steaming, and peeling sweet potatoes lowers their antioxidant content. They clarified that the oxidative polymerization of phenolic acids during peeling and size reduction, which includes encouraging colouring of the peeled and cooked sweet potato, is what causes the decrease in antioxidant capacity. This polymerization is catalysed by polyphenol oxidase.

According to Sun *et al.* (2014), The best way to preserve sweet potato leaves' polyphenols and antioxidant activity is to steam them. Through this method, the antioxidant activity was raised by 81.40%, 30.09% by baking, and 85.22% by frying. Furthermore, phenolic components such as 4,5-di-O-caffeoylquinic acid, 3,4-di-O-caffeoylquinic acid, 3,5-di-O-caffeoylquinic acid, and 4,5-tri-O-caffeoylquinic acid may be primarily responsible for the antioxidant properties of sweet potato leaves.

Other products like carrots, spinach, mushrooms, asparagus, broccoli, cabbage, green and red peppers, potatoes, and tomatoes also lost some of their antioxidant capacity when they were cooked (Halvorsen *et al.*,, 2006). Boiling, steaming, and cooking in a microwave all improve antioxidant activity. Stir-frying and roasting retained the antioxidant property of red pepper (Hwang *et al.*, 2012). In addition, total phenolics, chlorogenic acids, flavonols and Vitamin C of young potato tubers were not affected by cooking such as: microwaving, baking, boiling, steaming or stir-frying (Navarre *et al.*, 2010). The two varieties have antioxidant properties based on the results of the DPPH assay and the Follin-Ciocalteau assay. Though results show that the sweet potato tubers used in the study have antioxidant property, the %RSA and the TPC values taken are lower than results from other literatures. It is recommended that samples should be freeze dried rather than air dried before the analysis. According to Sablania *et al.*, (2011), air drying can cause significant reductions in anthocyanins, phenolics, and antioxidant activity while freeze drying improved retention of phytochemicals during processing and in some cases it even increased the concentration of phytochemicals. The phenolic content and antioxidant activity lost is about 60% in air drying as compared to freeze drying (Koala *et al.*, 2013).

***Conclusion*:** While the cooking procedures had an impact on the TPC value of the orang-fleshed sweet potato, they had no discernible effect on the TPC value of the purple-fleshed sweet potato. In the case of the orange variety, baking and frying reduced the total phenolic content of the sweet potato tubers, whereas steaming and boiling enhanced it. The orange-fleshed sweet potato's total phenolic content was influenced by the following cooking methods: boiling, steaming, baking, and frying. The cooking methods have no effect on the total phenolic content of purple-fleshed sweet potatoes, although they do have a higher total phenolic content than orange-fleshed sweet potatoes. This suggests that purple-fleshed sweet potatoes' phenolic components can withstand heat treatment. The antioxidant activity of the orange fleshed sweet potato has been considerably enhanced by all of the processing methods utilised in this study,

including steaming, boiling, baking, and frying, according to the DPPH assay results. When it came to the orange fleshed sweet potato, steaming produced the most rise out of all the treatments. Baking, frying, and steaming have all markedly enhanced the sweet potato tuber's capacity to scavenge radicals, especially for purple-fleshed sweet potatoes. The sample's ability to scavenge radicals was unaffected by boiling. The process of steaming led to the highest increase in the purple skinned sweet potato tubers' ability to scavenge radicals. In summary, the following order of cooking methods boosted the antioxidant properties for both varieties: steamed, fried, baked, boiled, and uncooked. According to the results of both the DPPH assay, the purple-fleshed variety had greater antioxidant activity than the orange-fleshed variety. Based on the results, steaming is the most effective method of processing sweet potato tubers when compared to boiling, baking, and frying. With the exception of the TPC of purple fleshed sweet potatoes, which did not change much, steaming boosted the antioxidant property of the sweet potato tubers for both the DPPH assay and the Follin-Ciocalteau assay. Boiling produced a better outcome than baking or frying. The TPC value of orange-fleshed sweet potato tubers was reduced by baking and frying, while the antioxidant properties of the sweet potato samples were unaffected by boiling. Consequently, steaming is the ideal method of cooking sweet potatoes—whether they have orange or purple flesh—in order to get the most antioxidant activity from them. It is also advised to look at how different processing methods and storage strategies affect the antioxidant qualities of sweet potatoes. The impact of planting methods on the antioxidant capacity of sweet potatoes can also be studied. It is advised to look into different coloured sweet potato varieties and use different techniques for detecting the antioxidant property in order to ascertain whether there is a relationship between the colour of the sweet potato and its antioxidant property.

***Authors' contributions*:** Present manuscript has one author.

***Funding*:** by Authors

***Ethical statement*:** This article does not contain any studies with human participants or animal.

***Availability of data and material*:** We declare that the submitted manuscript is original work, and data can be available when requested by journal.

***Code Availability*:** Not applicable

***Consent for publication*:** authors is giving the consent to publish this research article in JGIAS

REFERENCE

Ares, G. and A. Ga´mbaro. 2007. Influence of gender, age and motives underlying food choice on perceived healthiness and willingness to try functional foods. Appetite 49:148-158. https://doi.org/10.1016/j.appet.2007.01.006

Bellail, A., O. Shaltout, M. Youssef and A. El Gamal. 2012. Effect of Home-Cooking Methods on Phenolic Composition and Antioxidant Activity of Sweetpotato (Ipomoea batatas (L.) Lam.) Cultivars Grown in Egypt. Food and Nutrition Sciences 3:490-499. http://dx.doi.org/10.4236/fns.2012.34069

Bemben, K. and B.Sadana. 2013. Effect of cooking methods on the nutritional composition and antioxidant activity of potato tubers. International Journal of Food and Nutritional Silences 2(4):26-30. http://www.ijfans.com/vol2issue4/5.pdf

Buyukokuroglu ME., I. Gulcin, M. Oktay and O.I . Kufrevioglu. 2001. In-vitro antioxidant properties of dantrolene sodium. Pharmacological Research 44:491-495. https://www.ncbi.nlm.nih.gov/pubmed/11735355

Bye ZL., P. Keshavarz, Lane GL, H.Vatanparast . 2021.What role do plant-based diets play in supporting the optimal health and well-being of Canadians? A scoping reviews. Advances in Nutrition 12:2132-2146.

Chan, E., Y.Lim and M. Omar. 2007. Antioxidant and antibacterial activity of leaves of Etlingera species (Zingiberaceae) in Peninsular Malaysia. Food Chemistry 104:1586-1593. https://doi.org/10.1016/j.foodchem.2007.03.023

Devasagayam T.P., J.C. Tilak, K.K. Boloor, K.S. Sane, S.S. Ghaskadbi and R.D. Lele. 2004. Free radicals and antioxidants in human health: current status and future prospects. The Journal of the Association of Physicians of India 52:794-804. https://www.ncbi.nlm.nih.gov/pubmed/15909857

Ghasemzadeh, A., H. Jaafar and A. Rahmat. 2010. Antioxidant Activities, Total Phenolics and Flavonoids Content in Two Varieties of Malaysia Young Ginger (Zingiber officinale Roscoe). Molecules 15:4324-4333. https://doi.org/10.3390/molecules15064324

Gupta, U.C. and S. C.Gupta. 2013. Phytochemicals and Antioxidants: An Evaluation in Understanding the Human Lifeline. Current Nutrition and Food Science 9:298-309. https://doi.org/10.2174/157340130904131122094106

Halvorsen, B., M. Carlsen, K. Phillips, S. Bøhn, K. Holte, D. Jacobs Jrand R. Blomhoff. 2006. Content of redox-active compounds (ie, antioxidants) in foods consumed in the United States. American Journal of Clinical Nutrition 84:95-135. https://doi.org/10.1093/ajcn/84.1.95

Hwang, G., Y. Shin, S. Lee, J. Leeand, S. Yoo. 2012. Effects of Different Cooking Methods on the Antioxidant Properties of Red Pepper (Capsicum annuum L.).

Preventive Nutrition and Food Science 17:286-292. https://doi.org/10.3746%2Fpnf.2012.17.4.286

Ismail,A., Z. Marjan and C. Foong. 2004. Total antioxidant activity and phenolic content in selected vegetables. Food Chemistry 87:581-586. doi:10.1016/j.foodchem.2004.01.010

Jacob R., and BJ. Burri. 1996. Oxidative damage and defense. American Journal of Clinical Nutrition 63:985S-990S.

Jat, D. and M. Nahar. 2017. Oxidative stress and antioxidants : an overview. International Journal of Advanced Research and Review 2:110-119.

Ji, H., H.X. Zhang, H.T. Li and Y.C. Li. 2015. Analysis on the Nutrition Composition and Antioxidant Activity of Different Types of Sweet Potato Cultivars. Food and Nutrition Sciences 6:161-167. http://dx.doi.org/10.4236/fns.2015.61017

Jothy, S.L., Z. Zuraini and S. Sasidharan. 2011. Phytochemicals screening, DPPH free radical scavenging and xanthine oxidase inhibitiory activities of Cassia fistula seeds extract. Journal of Medicinal Plants Research 5:1941-1947. http://www.academicjournals.org/JMPR

Jung, J., S. Lee, N. Kozukue, C. Levin and A. Friedman. 2011. Distribution of phenolic compounds and antioxidative activities in parts of sweet potato (Ipomoea batata L.) plants and in home processed roots. Journal of Food Composition and Analysis 24:29-37. https://doi.org/10.1016/j.jfca.2010.03.025

Koala, M., A. Hema, K. Somé, E. Palé, A. Sérémé, J. Belem and M. Nacro. 2013. Evaluation of Eight Orange Fleshed Sweetpotato (OFSP) Varieties for Their Total Antioxidant, Total Carotenoid and Polyphenolic Contents. Journal of Natural Sciences Research 3:67-72.

Mark-Herbert, C. 2002. Functional food for added value. Developing and marketing a new product category. Doctoral dissertation. ISSN 1401-6249, ISBN 91-576-5837-4. Retrieved from http://pub.epsilon.slu.se/298/1/cillamark-herbertavhandling2002-3.pdf

Navarre, D., R. Shakya, J. Holden and S. Kumar. 2010. The Effect of Different Cooking Methods on Phenolics and Vitamin C in Developmentally Young Potato Tubers. American Journal of Potato Research 87:350-359. DOI: 10.1007/s12230-010-9141-8

Padda, MS and DH. Picha. 2007. Methodology optimization for quantification of total phenolics and individual phenolic acids in sweetpotato (Ipomoea batatas L.) roots. Journal of Food Science 72:C412-416. https://doi.org/10.1111/j.1750-3841.2007.00448.x

Perla, V., D.G. Holm and S.S. Jayanti. 2012. Effects of cooking methods on polyphenols, pigments and antioxidant activity in potato tubers. Food Science and Technology 45:161-171. https://doi.org/10.1016/j.lwt.2011.08.005

Rautenbach, F., M. Faber, S. Laurie and R. Laurie. 2010. Antioxidant capacity and antioxidant content in roots of 4 sweetpotato varieties. Journal of Food Science 75:C400-405. https://doi.org/10.1111/j.1750-3841.2010.01631.x

Sablania, S. Andrews, P. Davies, N. Walters, T. H. Saez and L. Bastarrachea . 2011. Effects of Air and Freeze Drying on Phytochemical Content of Conventional and Organic Berries. Drying Technology: An International Journal 29:205-216.

Sarma, A., Mallick A. and A. Ghosh. 2010. Free Radicals and Their Role in Different Clinical Conditions: An Overview. International Journal of Pharma Sciences and Research 1:185-192.

Singh, R., S. Devi and R. Gollen. 2015. Role of free radical in atherosclerosis, diabetes and dyslipidaemia: larger-than-life. Diabetes Metabolism Research and Reviews 31:113-126. https://doi.org/10.1002/dmrr.2558

Jamshidi-Kia F., JP Wibowo, M, Elachouri, R.Masumi, Salehi Jouneghani and A. Z. Abolhassanzadeh. 2022. Battle between plants as antioxidants with free radicals in human body. Journal of Herbmed Pharmacology 9:191-199. http://herbmedpharmacol.com/Article/jhp-36627

Sun H, Mu T, L. Xi and Z. Song. 2014. Effect of Domestic Cooking on Polyphenols and Antioxidant Activity of Sweet Potato Leaves. Journal of Agricultural and Food Chemistry 62:8962-89699. https://doi.org/10.1021/jf502328d

Teow, C. Truong., V.R. McFeetrs, R.Thompson, K. Pecota, C. Yencho. 2007. Antioxidant activities, phenolic and b-carotene contents of sweet potato genotypes with varying flesh colours. Food Chemistry 103:829-838. https://doi.org/10.1016/j.foodchem.2006.09.033

Tokuşoğlu, Ö. and Z.Yildirim. 2012. Effects of cooking methods on the anthocyanin levels and antioxidant activity of a local turkish sweet potato (Ipomea batatas (L.) Lam) cultivar hatay kirmizi: boiling, steaming and drying effects. Turkish Journal of Field Crops 17:87-90. http://dergipark.ulakbim.gov.tr/tjfc/article/viewFile/5000089147/5000082781

Trinidad, T., R. Sagum, A. Mallillin, M. Borlagdan, M. Leon and T. Aviles. 2013. Sweet Potato and Cassava Can Modify Cholesterol Profile in Humans with Moderately Raised Serum Cholesterol Levels. Food and Nutrition Sciences 4:49-495. doi: http://dx.doi.org/10.4236/fns.2013.45062 .

Truong, V. and R. Avula. 2010. Sweet potato puress and powders for functional food ingredients. In R. C. Ray and K. I. Tomlins (Eds.), Sweet Potato: Post Harvest Aspects in Food New York: Nova Science Publishers, Inc. retrieved from. pp.117-161. https://fbns.ncsu.edu/USDAARS/Acrobatpubs/S114-150/S134.pdf

Truong, V.D., R. F. McFeeters, R.T. Thompson, L.L. Dean and B. Shofran. 2007. Phenolic Acid Content and Composition in Leaves and Roots of Common Commercial Sweet potato (Ipomea batatas L.) Cultivars in the United States. Journal of Food Science 72:C343-C349.

Turkmen N., F. Sari YS. Velioglu. 2005. The effect of cooking methods on total phenolics and antioxidant activity of selected green vegetables. Food Chemistry 93:713-718. doi:10.1016/j.foodchem. 2004.12.038

World Health Organization. 2018. Healthy diet. Retrieved from https://www.who.int/news-room/fact-sheets/detail/healthy-diet